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AUTHOR: Thaxter L. Goodell

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*A new kind of intelligence lore
struggles for recognition and is vin-
dicated.*

CRATOLOGY PAYS OFF

Thaxter L. Goodell

During the 1962 Soviet military buildup in Cuba the term cratology came into general use in the intelligence community to designate a new technique for identifying military cargoes from the appearance of their shipping crates. Although the Cuban crisis was not solely responsible for the development of the technique, if it had not made crates a prominent issue the word would probably never have been coined. This article describes how the catalog of information constituting cratology was acquired and how it paid off at a crucial moment. Its success rested on a foundation of dozens of separate reports, photographs, and other pieces of evidence, most of them individually inconsequential, which proved invaluable collectively.

Prior to 1961, reasonably complete reporting on arms deliveries to countries receiving Soviet military assistance was made possible by a variety of sources. In early 1961, however, a number of these sources dried up, and an intensive search was mounted for new methods of monitoring the movement of Soviet military equipment. Although needed for the entire Soviet military aid program, this effort was spurred by the situation even then in Cuba, where the first delivery of MIG jet fighters was imminent in the spring of 1961.

CIA officers discussed with the Office of Naval Intelligence ways to improve reporting on Soviet arms traffic and at ONI request agreed to prepare a Collection Guide on how Soviet military equipment is shipped. Tailored especially for observers in the Turkish straits and other waterways where Soviet merchant ships must pass, the guide was to lay out the broad outlines of Soviet military aid policy and then detail methods of spotting arms shipments. It could explain that almost all such shipments moved from the Black Sea on Soviet ships, point out that military and civilian cargoes were seldom mixed, and list characteristics such as light loads, false declarations, and other tip-offs betraying the Soviet arms carrier.

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Deliveries on Deck

Primarily, however, the guide was to show examples of military deck cargoes on Soviet ships and in particular the kinds of crate used for aircraft. Extensive reporting had established that all Soviet military aircraft are delivered as deck cargo, which alert observers can easily report on if they know what to look for. MIG crates, for example, had frequently been reported as looking like railroad cars.

A search was therefore begun for photographs of crates in order to include them in the guide. The files of the Graphics Register were combed for pictures of crated deck cargoes. Offices throughout Washington were asked to dredge up examples of crates. Aircraft production specialists and merchant shipping experts were consulted on how aircraft are shipped. Most importantly, hundreds of photos of Soviet ships passing through the Turkish straits were scanned for deck cargoes. U.S. Navy personnel in Istanbul had been taking these photos for years although there were relatively few consumers for them in the intelligence community.

Quantities of photographs poured in as the search went on. Most of them were discarded as inadequate in showing deck cargo, and in many that had good pictures of crates these could not be identified; but by collating the photos with other intelligence it became clear that different kinds of Soviet aircraft were invariably shipped in distinctive crates on deck. Aside from the Cuba problem, air order-of-battle intelligence for such countries as the UAR and Indonesia had become increasingly important as Soviet military aid deliveries had mushroomed, and crate counting seemed a reasonable way to make up for a lack of other delivery information.

At this time the most clearly identifiable crate was that for the MIG-19 fighter, which had just begun to be shipped abroad. In 1961 a Royal Air Force reconnaissance mission photographed a ship in the Red Sea which had on deck 16 crates of a type never seen before. Subsequent clandestine reporting had that ship delivering 16 MIG-19s to Iraq. Four shorter crates aboard the same ship—later identified as for MIG-15s—remained a puzzle for some time during this infancy of cratology. Nevertheless, the incident was a milestone in the development of the new technique.

The incident also illustrates well the difficulty at that time of getting good reporting on Soviet military shipments. Earlier photographs than those the British took in the Red Sea and passed to the U.S. analysts had been taken when this ship sailed past Istanbul, but

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these had been lost in the shuffle and did not become available in Washington for many weeks; and the interim reporting described the MIG-19 containers as large vans. Then later, as the ship proceeded up the Shattalarab toward Basra, it was photographed again, but the Washington analysts concerned were not even aware that this was being done. Thanks largely to efforts of personnel in the Graphics Register, these photos were obtained for use in the guide they were the best shots then available of crated aircraft and the most useful material collected for the guide. By the time the guide was published, however, the Soviets had unfortunately all but stopped shipping MIG-19s.

Even after it was clearly established that these crates were used for MIG-19 fighters, there were few in mid-1961 who would accept the evidence. When in June of that year a ship en route to Cuba was seen with a dozen of them on deck, it proved nearly impossible to report the shipment in a coordinated publication before it was confirmed—much later—by high-altitude photography. The failure to observe the first deliveries of MIG-15s to Cuba the month before, in May, was not due to any extraordinary Soviet security measures but to the fact that U.S. intelligence did not photograph ships en route to Cuba and did not yet accept cratology as an analytical technique.

Step Toward Respectability

In the summer of 1961 the Collection Guide finally took shape. It described the reporting needed to follow Soviet maritime arms traffic, and it included all photographs possible of identifiable deck cargoes. It correctly identified the crates for MIG-15 and MIG-19 jet fighters, MI-4 helicopters, and IL-28 bombers. Although it was a relatively primitive effort, the putting it together had been good exercise in the use of intelligence from all sources. The MIG-19 identification depended on the cited RAF reconnaissance mission in combination with clandestine reports from Iraq and the UAR and an East European defector's sketch of the crate. Identifying the MIG-15 crate was partly guesswork, but a clandestine report from Indonesia giving its dimensions narrowed the choice; confirmation was achieved much later by putting together clandestine reports and ship photography. MI-4 helicopter crates were identified chiefly through the report of a U.S. air attaché in Morocco: it described the one used for an MI-4 shipped to a Soviet trade fair in such detail that photo-

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graphs of similar crates taken in the Shattalarab were recognized and could be included in the guide.

The most important crate identification in the guide, that for IL-28 bomber fuselages, had also been made through a combination of information from different sources. The clandestinely procured report of an Indonesian arms mission which visited the USSR and Eastern Europe in the late 1950s contained accurate dimensions for these crates. Photographs of Soviet ships taken at Istanbul over a period of several years showed many long crates fitting the specifications of the Indonesian report. A check into the particular voyages of these ships showed they had all gone to countries holding IL-28 bombers. The conclusion that these were indeed IL-28 crates was virtually inescapable.

When the Collection Guide was first published in 1961 its authors were generally skeptical about how much interest or effort it would arouse. To their surprise, it stimulated considerable interest in reporting on arms shipments, including photography and reports on crates and the contents of crates. Observers especially in Istanbul but also in the UAR, Indonesia, and other countries where Soviet arms aid is prominent began to increase their reporting on crates. This enhanced awareness of crates as a source of information on Soviet military aid led gradually to the solution of additional identification problems. At the same time the acquisition of most of the major documents concerning Soviet-Indonesian arms deals provided a gold mine of detailed data on Soviet military aid practices, frequently including information useful in solving crate puzzles. Similar information obtained later in Iraq also contributed substantially to the development of cratology.

Expanding Scope

An officer from the U.S. naval attaché's office in Djakarta turned in a perfect performance in using the guide to identify a group of crates on the docks in Indonesia. As instructed in the guide, he paced off the dimensions of the crates, he photographed them, he noted their markings, and he wrote a report describing them. Moreover, he did not hesitate to reach conclusions about them: he identified both a helicopter crate and IL-28 bomber crates. His photos of the latter turned out to be most important; they were the only close-ups of IL-28 crates available to the intelligence community.

In late 1961 another advance was made when IL-14 transport aircraft were moved by sea for the first time. Previously they had

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always been flown to their destinations, but when Cuba bought them they had to be sent by ship. The Soviets placed them, wings removed, on the deck of ships designed to carry timber, usually two or three aircraft to a ship. Around each they built a large wooden structure, usually of a shape like a cello. About a dozen of these transports reached Cuba in late 1961 and early 1962, but only a few of them were photographed and these could not be specifically identified by the photo interpreters, who were not working with other intelligence sources. A few budding cratologists, however, got hold of the photos, and this bit of information was tucked away with all the rest.

In early 1962 a major step forward was taken when MIG-21 jet fighter crates were spotted in the UAR. Several months were to pass before photographs became available, but alert case officers in Egypt provided a description of the crates soon after the Soviets had begun shipping this plane abroad. In the summer of 1962 the first photographs were received, from the assistant naval attaché's office in Istanbul. Alone these would have been useless, but taken in conjunction with the earlier information from Egypt they clearly showed the shipment to consist of MIG-21s.

The Cuban Buildup

By the time the 1962 Soviet military buildup in Cuba started in July, cratology was an established technique, but its adherents were confined to a very small circle. It was not accepted in many quarters of the community, and coordinated intelligence based on crate counts was a rarity. Nonetheless, what knowledge there was of crates was incorporated into the efforts that were being made to bolster collection on Cuba. Photos of identifiable crates were included in a large Cuba collection guide, and efforts to improve the monitoring of Soviet shipping were continued. But because so many in the intelligence community were unconvinced of the usefulness of these efforts, information on the first military shipments of the buildup was most incomplete.

The first military shipments were detected as they left the Black Sea in mid-July, and steps were taken immediately to provide for photographing all ships and identifying any significant deck cargoes; joint ONI-CIA efforts at the Bosphorus had improved considerably by mid-1962. But now many of these ships unfortunately transited the straits at night or in bad weather, making photography impossible.

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Moreover, a sizable number of the military shipments were for the first time made from Soviet Baltic ports, where our capabilities were rather limited. And in the Atlantic there was no adequate network to cover Soviet shipping and get photographs. Thus not all of the ships carrying military cargoes were photographed during the first six weeks, and the results on those that were were seldom disseminated in time to be useful. By mid-August the system for ship photography was much improved, but it was not perfected until after the October crisis.

Meanwhile, intelligence analysis focused on the flood of clandestine and refugee reports from Cuba. By mid-August it was abundantly clear that something extraordinary was going on there, involving an exceptionally large amount of materiel and of Soviet manpower. Military construction was under way at many separate locations. By mid-August many were convinced that a missile-equipped air defense system, among other things, was being set up. The evidence included ship photography and descriptions of activities in many separate reports. Some of the reports were remarkably similar to those generated when the Soviets first shipped surface-to-air missiles to Indonesia.

High-altitude photography of 29 August gave the first confirmation of this conclusion. It also showed for the first time that six Komar guided missile boats had been delivered to Cuba. There was no immediate explanation of how these boats reached Cuba; it seemed the system for watching shipping must have broken down badly. A review of the ship photography, however, turned up a ship which appeared to be carrying a big pile of wood. A sharp-eyed expert in Soviet naval matters with a keen interest in the Komars correctly concluded that the pile of wood was in fact two Komar boats covered by a wooden housing to protect and disguise them. Eventually all six Komars were pinned down to specific ships, and subsequent Komar shipments were detected well in advance of arrival. The Komar "crate" had taken its place in the files of cratology.

The MIG-21 Story

MIG-21s were the next major crate issue in Cuba. High-altitude photography of 5 September showed one assembled MIG-21 at Santa Clara airfield and fuselage crates for a dozen or more others. At that time no photographs of ships en route to Cuba had come in showing crates like the recently identified MIG-21 containers. Was

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it possible the Soviets were changing their ways and starting to carry aircraft crates below deck? Those skeptical of cratology quickly seized on this failure as reason to distrust crate counts for determining aircraft inventories.

Gradually, however, the pictures belatedly came in. Crates spotted on the decks of two ships accounted for at least 22 MIG-21s, probably a few more. These, along with some U-2 photography and ground observer reports, led to the conclusion that MIG-21 holdings in Cuba were at least in the 25 to 30 range. The publication of this conclusion in early October and the subsequent raising of the total to 35 on the basis of new ship photography touched off a lively intelligence controversy over the validity of crate counts. There was still only one MIG-21 that had actually been seen in high-altitude photography, and that nearly a month before. The backers of cratology argued that in the absence of new photographs of Cuban airfields one had to reach conclusions on the basis of whatever information was available.

Cratology received its vindication on 20 October, when aerial photography over Santa Clara showed 35 fully assembled MIG-21 fighters, as well as four other aircraft identified as probable MIG-21s. The achievement was lost in the crush of events, of course, for by now the photos of medium-range missiles had touched off the climactic East-West confrontation. Nevertheless the advance knowledge of a buildup of high-performance jet fighters in Cuba had been of considerable value. Without the warning provided by cratology, the military planners who went into crash programs in October would have been far more startled by the photos of the 20th showing 35 to 40 MIG-21s ready to bolster Cuba's air defense system.

From Defense to Offense

While the resolution of the MIG-21 controversy was a triumph for cratology, the most important contribution the technique made to the intelligence effort in the Cuban buildup was in identifying IL-28 bombers. If it never leads to another significant conclusion, this one achievement assures cratology at least a small niche in the annals of intelligence.

In early October the increasing tension generated by the buildup was illustrated in a dispute over a large "cello-like" object seen on the deck of a ship. The container was large enough for any of a variety of aircraft, including the IL-28 bomber, a weapon of offense.

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The cratologists, however, were sure that such a structure housed transport aircraft, being exactly the same as those used earlier to ship IL-14s to Cuba. Again argument flared over the validity of concluding anything about contents from the shape of a wooden structure on deck. This time, however, the negative conclusion that the structure probably did not contain an IL-28 bomber was backed up by a timely clandestine report and a photograph from Leningrad showing an aircraft being loaded onto a ship.

Meanwhile, clandestine reports and refugee interrogations continued to pile up. Aerial photography had established that the buildup encompassed a number of defensive systems, but ground observer reports increasingly suggested items which could not be reconciled with defensive measures. Two observers reported the arrival of IL-28 bomber crates about 20 September, and at least one of the two had based his identification on photographs of IL-28 crates in the Cuba collection guide. As usual, these reports were not considered "hard" evidence, although in retrospect at least one was valid.

The moment of truth for cratology occurred on 10 October, when the first photographs of IL-28 crates en route to Cuba reached headquarters. Taken on 28 September, these showed the Soviet ship *Kasimov* carrying ten crates which could only be for IL-28 bombers. To make doubly sure and to convince others, however, the cratologists drew together all the precedents and evidence—photos and report from the naval officer in Djakarta showing an end section of the crates, the Indonesian document giving the dimensions for IL-28 containers, an old picture from Istanbul showing such crates being shipped in 1959, a recent Istanbul photo showing the IL-28 crate still in use on a ship en route to the UAR, and of course the clandestine reports that the bombers had recently arrived in Cuba. A memorandum was prepared for the DCI reporting the new information and detailing the basis for the weighty conclusion.

The observer reports which during the previous three weeks had pointed to the possibility of a radical change in the nature of the military buildup in Cuba had not been generally accepted as firm. They had raised the flag of caution, but so-called hard evidence was required for a conclusion that there really had been such a change. The IL-28 crates provided this evidence. On the heels of persistent reports pointing to MRBMs on the island, they led to the 14 October flight of the U-2 which brought back the first photos of strategic missile installations.

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Additional air photography shortly thereafter turned up solid proof, if it were still needed, of the validity of crate counting. Low-altitude photographs at San Julian airfield in Pinar del Río province caught a cratologist's dream—IL-28s being uncrated and assembled. This convincing evidence of the validity of crate information was entirely eclipsed at the time by the threat of the Soviet strategic missiles, but further evidence was obtained during the withdrawal of the bombers from Cuba in early December. The Soviets, in order to show they were not cheating, broke open the crates on the decks of ships to allow inspection by U.S. personnel hovering nearby in helicopters.

As the crisis receded and efforts were directed toward sorting out the pieces and reviewing the status of Soviet forces on the island, a few other bits of cratology were produced. Largely by means of crate counts, for instance, it was discovered that roughly 100 Soviet helicopters had been delivered to Cuba, perhaps two-thirds of them during the buildup. The size of this formidable counterinsurgency weapon in Cuban hands was not apparent from other sources. Crates for two types of cruise missiles were also identified as a result of the repeated high and low altitude photography over Cuba, and the information has since proved useful in other countries.

Reflections

The upshot was acceptance of cratology; the Cuban experience demonstrated that this is a legitimate tool for intelligence analysts. In a broader sense, it demonstrated the way many of the intelligence community's resources can be successfully combined to solve a problem—the sort of problem which normally looms large for only a few specialists but in this instance took on greatly increased significance.

Since that time regular procedures have been adopted to insure that photographs are obtained of every Soviet ship which is a potential arms carrier. The intelligence community has never worked together better than now in following Soviet arms shipments. On those to Cuba, the intense effort now applied is a far cry from the rather haphazard picture-taking described at the beginning of this article.

Oddly enough, despite public attention to cratology, the Soviets do not seem to have radically changed their procedures in shipping arms abroad. We continue to see combat aircraft being crated in precisely the way they have been for the past decade. With the notable exception of a recent delivery of MIG-17s to Cuba, aircraft continue to be carried as deck cargo. Recently it was determined

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that Egypt's holdings of MIG-21 jet fighters have climbed to over 100, and this conclusion was based almost entirely on crates; fewer than half this number have ever been seen on the ground.

The list of identifiable crates has grown to cover about 17 different containers, including all the types of combat aircraft the Soviets have shipped abroad. It will probably continue to lengthen. The Czech L-29 jet—now becoming the standard trainer—is being shipped overseas, and the USSR is selling the huge MI-6 helicopter to non-Communist countries.

Cratology is a very narrow intelligence specialty. It cannot hope to have answers for more than a very limited number of intelligence puzzles, and its chief use may lie in helping to get accurate air-order-of-battle information on countries receiving Soviet military aid. But the story of its use in Cuba does have a moral applicable to dozens of intelligence problems, namely, that momentous conclusions must frequently rest on evidence piled up in a humdrum fashion, and obscure knowledge can often provide the key piece in a larger picture. Many a collecting officer abroad must wonder why anyone would want some of the information the cratologist asks for. The individual pieces are indeed trivial, but together they have frequently served useful purposes and in at least one instance paid off handsomely.

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